

# Exhibit C

UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF GEORGIA  
ATLANTA DIVISION

COBB COUNTY, DEKALB  
COUNTY, and FULTON  
COUNTY, GEORGIA,

Plaintiffs,

v.

BANK OF AMERICA  
CORPORATION, et al.

Defendants.

CIVIL ACTION  
NO.: 1:15-CV-04081-LMM

**DECLARATION OF SEAN T. MALONE, PH.D.**

I, SEAN T. MALONE, declare pursuant to 28 U.S.C. § 1746 as follows:

1. I am over the age of 18 and fully competent to make this Declaration.
2. My employer, Analytic Focus LLC, has been retained by Evangelista Worley LLC and Milberg Coleman Bryson Phillips Grossman LLP, counsel for Cobb, DeKalb, and Fulton Counties (“Plaintiffs”) in this action against the Bank of America entities, including Countrywide and Merrill Lynch (“Defendants”). I am a senior statistical research associate at Analytic Focus LLC which has been retained to provide support to Plaintiffs’ expert, Dr. Gary Lacefield in implementing statistical analysis of the origination and servicing data regarding Defendants’ alleged discrimination, among other matters.
3. I received my Bachelor of Arts degree in Financial Economics from Capital University, my Master of Science degree in Finance from the University of Texas at San Antonio, and my doctorate in Finance from the University of Texas at San Antonio.
4. Since July 2019, I have been a senior statistical research associate at Analytic Focus LLC, which provides consulting services for numerous public and private entities on a wide range of topics. My experience includes statistical, financial, and economic analysis to support expert testimony in litigation.
5. Prior to joining Analytic Focus, LLC, I taught undergraduate courses in business finance; investments; money and banking; and financial case studies at the University of Texas at San Antonio.

6. My professional and academic experience along with a list of my publications in the previous 10 years are included in my resume, a true and correct copy of which is attached as Exhibit 1.

7. I am familiar with the methods Dr. Gary Lacefield uses to examine discrimination in mortgage origination and servicing because I have provided statistical programming support for Dr. Lacefield in this type of analysis on multiple occasions dating back to 2019. In general, Dr. Lacefield identifies loan characteristics that may have negative consequences (including higher default rates) for borrowers. For example, these may include characteristics like high loan-to-value ratios, negative amortizing loans, loans with prepayment penalties, among others. At the instruction of Dr. Lacefield, I have conducted a series of statistical analyses that test whether there are significant differences in the percentage of minority borrowers who have loans with these specific features relative to control groups of white non-Hispanic borrowers. I understand this methodology is consistent with “indicators of potential disparate treatment” summarized in Interagency Fair Lending Examination Procedures.<sup>1</sup>

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<sup>1</sup> For example, “Indicators of potential disparate treatment by [s]teering such as: [... s]ignificant differences in the percentage of prohibited basis applicants in loan products or products with specific features relative to control group applicants. Special attention should be given to products and features that have potentially negative consequences for applicants (i.e., non-traditional mortgages, prepayment penalties, lack of escrow requirements, or credit life insurance)[.]” See page 10 of the Interagency Fair Lending Examination Procedures (2009) from the member institutions of the Office of the Comptroller of the Currency, Federal Deposit Insurance

8. Plaintiffs allege Defendants exhibited discriminatory behavior in origination and servicing as far back as 2004. The actions taken between January 2004 and November 2013 may have caused foreclosures before and after November 2013. To assess the discrimination allegations, it is necessary to conduct analysis on all loans originated since January 2004 regardless of whether such loans were still serviced after November 2013.

9. The failure to include loans not serviced on or after November 2013 will 1) bias prevalence rate estimates for certain loan characteristics at the time loans were originated, 2) bias the results of statistical tests comparing prevalence rates between minority borrowers and non-minority borrowers, and 3) limit the ability of such tests to find statistically significant differences when practically significant differences may, in fact, exist.

10. First, Plaintiffs make assertions, that if true, would describe ideal conditions for a sample selection bias called “survivorship bias.”<sup>2</sup> In the context of this litigation, “survival” means a loan continues to be serviced by Defendants after November 2013. An important reason a loan might not survive is that the loan

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Corporation, Federal Reserve Board, Office of Thrift Supervision, and National Credit Union Administration.

<sup>2</sup> Survivorship bias is a familiar concept in financial analysis. For example, in the study of investment fund performance where the datasets only include currently existing investment funds and exclude funds that have ceased operations (which were more likely to have performed poorly), the average performance of investment funds appears better than it really was. This example of survivorship bias in financial research has often been taught in investment courses. For example, see Zvi Bodie, et al., Investments (9th ed. 2010) at page 915.

defaults and is foreclosed upon prior to November 2013. Plaintiffs assert loan characteristics representing less favorable terms increased the likelihood that borrowers defaulted and were foreclosed upon. This relationship causes fewer loans with these less favorable terms to be in the surviving loan data sample and more loans without the less favorable terms to survive after November 2013.

11. Based on my experience, I expect Dr. Lacefield will estimate the prevalence rates of specific mortgage loan characteristics and borrower characteristics at origination as part of his analysis to identify discrimination within Defendants' mortgage origination practices. I also expect that he will do the same with rates of specific events in servicing and foreclosure as part of his analysis to identify discrimination in Defendants' servicing and foreclosure practices.

12. For a simple example of survivorship bias, consider 100 loans originated in year 0. Suppose 50 of the loans are given less favorable terms. Also, suppose that loans with less favorable terms have a 10% probability of foreclosure each year while all other loans have a 4% probability of foreclosure. The bank has originated 50% of the loans with less favorable terms in year 0. The effects of survivorship bias are demonstrated in Table 1 below.

13. Rolling these loans forward one year and considering only loans that survived, the prevalence of loans with less favorable terms becomes 48.39%.<sup>3</sup> If the originating behavior in year 0 is at question, one must look at all the loans originated in year 0, otherwise, the prevalence rate of the surviving loans underestimates the true rate of less favorable terms at origination. The same holds true when analyzing origination or servicing practices over an extended time period - the analysis must be able to draw on data for all the loans originated or purchased during the extended time period.

14. In addition, extending the length of the time period between origination events and the required survival date of those loans only exacerbates survivorship bias. The preceding example showed the bias after one year. However, the survivorship bias only grows as the time requirement for survival increases. After two years, the survivorship-biased estimate is 46.78%. After ten years, the survivorship-biased estimate is 34.40%.

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<sup>3</sup> 10% of the loans with less favorable terms are foreclosed. Only 45 loans with less favorable terms survive. 4% of the other loans are foreclosed. Only 48 of the other loans survive. Calculating the prevalence rate using only the loans that survive yields 48.39% or  $\left(\frac{45}{45+48}\right)$ .

**Table 1**

	All Loans Originated in <u>Year 0</u>	Loans Originated in Year 0 Still Surviving at the Beginning of Year 1	Loans Originated in Year 0 Still Surviving at the Beginning of Year 2	Loans Originated in Year 0 Still Surviving at the Beginning of Year 10
<b>Loans with Less Favorable Terms</b>	50	45	41	17
<b>Other Loans</b>	50	48	46	33
<b>Total Loans</b>	100	93	87	51
<b>% with Less Favorable Terms</b>	50.00%	48.39%	46.78%	34.40%

15. To correctly estimate the rate of loans given less favorable terms (50%), all loans originated in year 0 are necessary, not samples of loans composed only from those that survived past a later date. Those samples are systematically biased.

16. Second, Dr. Lacefield's method generally compares the percentage of minority borrowers with loans containing specific features to the percentage of non-minority borrowers with the same features. The magnitude of survivorship bias can be different between estimates of the minority and non-minority prevalence rates. Consequently, the results comparing the two rates will differ when using a dataset of surviving loans as opposed to the full dataset. An accurate estimate of the discriminatory effect requires a dataset inclusive of all loans originated, not just surviving loans. I provide a numerical example of how survivorship bias influences observed differences in proportions in the paragraphs below.

17. Consider 200 loans originated in year 0. Suppose 100 of the loans were originated to minorities and the remaining 100 were originated to non-minorities. Also, suppose that loans with less favorable terms have a 12% probability of foreclosure each year while all other loans have a 4% probability of foreclosure.

18. For the example, we assume 50% of minority borrowers were given less favorable terms and 25% of white loans were given less favorable terms. The difference in probabilities due to minority status is 25%. See the column labeled “Year 0” in Table 2 below. However, if we roll the loans forward one year<sup>4</sup> and estimate the difference using only the loans that survived, the estimate becomes inaccurate. The column labeled “Year 1” in Table 2 demonstrates how the estimate becomes 24.42% while the true originating behavior exhibited a 25% difference.

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<sup>4</sup> 12% of the loans with less favorable terms are foreclosed. That includes six from the minority borrowers and three from the non-minority borrowers. 4% of the other loans are foreclosed. That includes two from the minority borrowers and three from the non-minority borrowers.

**Table 2**

	<u>Year 0</u>		<u>Year 1</u>	
	Minority	Non-Minority	Minority	Non-Minority
<b>Loans with Less Favorable Terms</b>	50	25	44	22
<b>Other Loans</b>	50	75	48	72
<b>Total Loans</b>	100	100	92	94
<b>% Loans with Less Favorable Terms</b>	50%	25%	47.83%	23.40%
<b>% Minority minus % Non-Minority</b>	$50\% - 25\% = \mathbf{25\%}$		$47.83\% - 23.40\% = \mathbf{24.42\%}$	

19. Third, restricting the dataset will reduce the power of statistical tests Dr. Lacefield may reference when forming an opinion on the behavior of Defendants. Power is the “probability that a statistical test will reject the null hypothesis. [...] A powerful test has a good chance of detecting an effect when there is an effect to be detected.”<sup>5</sup> When both size of the effect (difference in prevalence rates) and the significance level of a test is fixed, the power of a test decreases as sample size decreases. Restricting the dataset to loans still being serviced after November 2013 will dramatically reduce the number of observations Dr. Lacefield can use for statistical purposes.

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<sup>5</sup> National Academy of the Sciences, Reference Manual on Scientific Evidence (3<sup>rd</sup> ed. 2011) at page 292.

20. The number of loans being compared between the minority group and the non-minority control group for each test may already have a small number of observations.<sup>6</sup> Further restricting the sample of origination behavior by including only surviving loans will reduce the power of tests and may conceal practically significant effects indicating discrimination.<sup>7</sup> In the next paragraph, I provide a numerical example of how tests on small samples may not have enough power to find statistically significant differences even though the effect may be practically significant.

21. Statistical test results with p-values less than 5% are generally considered statistically significant.<sup>8</sup> This term means that if the null hypothesis (e.g., the rate of unfavorable loan terms is the same for both minority and non-minority borrowers) is true, the magnitude of the observed differences in the sample would occur less than or equal to 5% of the time. However, consider an example where non-minority

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<sup>6</sup> Dr. Lacefield conducts many tests that compare proportions for different subsets of loans. For example, they may be subset by minority group of the borrower or the percentage of the minority population in the area. Further, tests only apply to relevant loans, creating even more subsets in the data (e.g., loans may not be relevant because of missing data, or different loan terms may have different loan-to-value ratio thresholds, or some characteristics may not apply to refinance loans).

<sup>7</sup> “Discerning subtle differences requires large samples; small samples may fail to detect substantial differences. When a study with low power fails to show a significant effect, the results may therefore be more fairly described as inconclusive than negative. The proof is weak because the power is low.” National Academy of the Sciences, Reference Manual on Scientific Evidence (3<sup>rd</sup> ed. 2011) at page 254.

<sup>8</sup> “In practice, statistical analysts typically use levels of 5% and 1%. The 5% level is the most common in social science, and an analyst who speaks of significant results without specifying the threshold probably is using this figure.” National Academy of the Sciences, Reference Manual on Scientific Evidence (3<sup>rd</sup> ed. 2011) at page 251.

borrowers get unfavorable loan terms 50% of the time and minority borrowers get them 63.75% of the time, the sample is not large enough at 200 loans (where 60% are white and 40% are minorities)<sup>9</sup> to produce a p-value that is less than 5%. This means one cannot conclude that the rate of unfavorable loan terms is different between non-minority and minority borrowers with 95% confidence. Meanwhile, 13.75% more minority borrowers receiving unfavorable loan terms than non-minority borrowers might be considered a practically meaningful difference. However, if the sample size were 400 loans, the very same statistical test would be able to reject the null hypothesis if the observed difference is as small as 10.62%. If the sample size were further expanded to 1,000 loans, the test would be able to reject the null hypothesis if the observed difference is as small as 6.5%.

22. Absent a full set of data for the loans Defendants originated and purchased in the Plaintiff Counties since January 2004, Dr. Lacefield's analysis of only the post

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<sup>9</sup> This is assumed for the following two hypotheticals as well.

November 2013 surviving loans will suffer as a result of the bias identified in paragraphs 9, 10, 16, 19, and 20 above.

23. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

This the 26th day of May 2022.

Sean T. Malone

SEAN T. MALONE, PH.D.

# Exhibit 1



## **SEAN T. MALONE, Ph.D.**

### **KEY QUALIFICATIONS**

Sean T. Malone is a consultant at Analytic Focus, LLC. Analytic Focus provides consulting services for numerous public and private entities on a wide-range of topics. Dr. Malone's experience includes supporting expert testimony for litigation topics including: construction defects, discriminatory mortgage lending, housing violations, and securities.

Dr. Malone has a strong background in data analysis and econometrics. His research has dealt with developing new event study measures for volatility and measuring their performance through Monte Carlo simulation; conducting fixed-income event studies; and developing and analyzing long/short equity factor investment strategies. In addition, he has coded credit default swap pricing models and conducted other empirical analyses using regression analysis, time-series models, and other statistical tools. Dr. Malone has significant scripting experience in Stata, Python, and Microsoft Excel VBA.

Prior to joining Analytic Focus, LLC, Dr. Malone taught undergraduate courses in business finance; investments; money and banking; and financial case studies at The University of Texas at San Antonio.

### **EDUCATION**

Ph.D., Finance, The University of Texas at San Antonio, 2019

M.S., Finance, The University of Texas at San Antonio, 2015

B.A., Financial Economics, Capital University, 2012

### **PROFESSIONAL EXPERIENCE**

Senior Research Associate, Analytic Focus, LLC, 2019 to present.

### **ACADEMIC EXPERIENCE**

Lecturer / Instructor, The University of Texas at San Antonio, 2015-2018.

Research and Teaching Assistant, The University of Texas at San Antonio, 2012-2015.

## PUBLICATIONS

- Malone, S., Kittiakarasakun, J., & Vidaurre, M. *3 Approaches for Measuring Short Squeeze Trading Damages*, Law360 (June 2, 2021), <https://www.law360.com/articles/1390079/3-approaches-for-measuring-short-squeeze-trading-damages>.
- Cowan, A., Seguin, P., & Malone, S. T. "Event Studies in Securities Litigation," in Comprehensive Guide to Economic Damages, Sixth Edition, Business Valuation Resources, LLC, Portland, ME, 2020.
- Malone, S. T. (2019). *Innovations in Financial Risk* (Doctoral dissertation, The University of Texas at San Antonio).
- Roychoudhury, S., & Malone, S. T. "Were Bank CEOs Overpaid?" *Journal of Business and Policy Research*, 2012, 7(4), 30-39.